ABSTRACT

Geography, History, and Economic Performance:
The Emergence and Evolution of Agrarian Institutions in Ecuador

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A familiar proposition from the literature on geography, institutions, and economic performance is that certain natural resources like mineral deposits or cash crops can create a "resource curse." In Ecuador, cash crops production did not create this effect. Instead, the agrarian institutions in provinces with cash crops production allowed more wealth accumulation than the institutions of the provinces where these products were not available. This paper argues that sixteenth-century population differences across Ecuadorian regions led to distinct agrarian institutions, and that the evolution of these institutions perpetuated specific economic outcomes. In particular, the Ecuadorian highlands had more extractive agricultural institutions than the coast. This institutional variation might explain why the coastal provinces rely less on agriculture today despite producing cash crops. Statistical analysis suggests that institutional differences might explain why the Ecuadorian coast has a higher per capita income and less extreme poverty than the provinces in the highlands.

Geography, History, and Economic Performance:
The Emergence and Evolution of Agrarian Institutions in Ecuador

by

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Para Laura Peña, mi madre, por su ejemplo de amor y fortaleza.

CHAPTER ONE

Introduction

Do institutions play a role in economic development? Scholars have argued that institutions indeed matter; however, the literature on institutions and economic performance has focused mainly on cross-country studies and has mixed evidence. The question of which institutions matter for economic development is not settled because the role of institutions on economic outcomes might be contingent on specificities of each country or region. Additionally, certain institutions might affect specific economic outcomes, but not economic development overall. Hence, the relevant question might be: which institutions matter for what outcome and in which context.

This thesis uses a single country to explore the links between institutions and economic performance. This approach allows an investigation of how different natural endowments led to distinct institutional paths; it also holds constant other potential determinants of institutional quality, like the legal tradition of the country or external shocks (e.g. a different colonial origin). This thesis uses two main analytical tools. First, it provides a historical narrative to show how distinct initial institutions had a path-dependent evolution that diverged. Second, this thesis uses three measures of economic outcomes to perform exploratory statistical tests of how institutions affect them.

Which Institutions?

Institutions are the formal constraints and informal norms that shape economic behavior (North 1990). The "rules of the game" are important for economic performance

because they provide the conditions that guide human interaction when the transactions costs derived from asymmetric information and uncertainty impede exchange (North 1990, Nelson and Sampat 2001).

The definition and enforcement of private property rights are the set of institutions most widely linked with economic performance, because they shape private investing decisions. Most of the literature that links institutions and economic outcomes use measures like rule of law, bureaucratic quality, corruption in government, risk of expropriation, or government repudiation of contracts, because these variables capture how secure are private property rights.

However, La Porta, Lopez-de-Silanes, and Shleifer (2004) criticize these measures because according to them rule of law or risk of expropriation are not institutions, but outcomes of institutional quality, just like economic performance. Hence, the relationship of a variable like risk expropriation with income may be due to an underlying third factor. La Porta *et al*. (2004) argue that legal traditions, like British common law or French civil law, are different institutions and are conceptually suitable for use in institutional analysis. Thus, according to La Porta *et al*. (2004), the institutions that matter are the formal laws that a given economy has.

Acemoglu and Robinson (2005) replicate and highlight two different sets of institutions that might influence economic performance: contract law and property rights. Contract law reduces transaction costs between private parties; these legal rules allow agents to change a contract in order to secure themselves from the opportunistic behavior of others. Institutions that define private property rights need a state to enforce them, so the role of political powers becomes relevant. If property rights institutions can not

restrict the action of the state, the monopolist of violence, then expropriation can not be prevented, and property rights cannot be enforced. Acemoglu and Robinson (2005) argue that different legal traditions (e.g. British or French) affect contracting institutions, but have little effect on property rights institutions, which they claim are the type of institutions that affect economic performance.

A critique of the recent literature on New Institutional Economics is that other sets of institutions may influence economic performance through alternative means beyond the definition and enforcement of private property rights. Furthermore, the focus on property rights definition may obscure the role of other institutions in development processes. According to Bardhan (2005, 500) there is the underlying assumption that once property rights are defined and well enforced "the market will take care of the rest . . . to proclaim the universal superiority of one coordination mechanism over another is naïve, futile and ahistorical." Bardhan (2002) suggests that the role of the state, in particular local governments, is crucial for development because they provide goods and help to solve coordination problems. Additionally, as Bockstette, Chanda and Putterman (2002) suggest, state structures of longer history may be a precondition for a good performance of markets.

The framework introduced by Acemoglu, Johnson and Robinson (2005) states that economic and political institutions affect economic performance; beyond that general framework, there is no agreement on which institution matters for economic performance. Nelson and Sampat (2001) suggest a different perspective of institutions as determinants of economic performance. In their view the different institutions used to explain economic performance have a unifying concept; that is, institutions can be seen

as social technologies that organize how inputs are combined to produce and how production is distributed.

The focus of this thesis is not on private property rights or political institutions, but instead on the set of historical agricultural institutions that existed in Ecuador in the last centuries. Thus the approach of the institutional analysis of this thesis follows the framework of Nelson and Sampat (2001). That is, agricultural institutions are regarded as a social technology that provided an organized and predictable structure for agricultural production.

Determinants of Institutional Quality

A common statement in the literature is that geographical conditions affect institutional quality, which in turn influences economic performance. Examples include Sokoloff and Engerman (2000), Acemoglu *et al.* (2001), Easterly and Levine (2003), Sala-i-Martin and Subramanian (2003), Lay and Mahmoud (2004). However, these articles differ in their views of the specific channels of transmission from geographical conditions to institutional quality.

Lay and Mahmoud (2004) suggest that a positive or negative effect of natural resources over economic growth depends on the type of resource exploited. Resources like oil or minerals have a higher negative effect on growth (the so called "resource curse") compared with agricultural and lumber products. These authors find that institutional quality is one of the channels through which natural resources, especially oil and minerals, affect growth.[1]

[1]Lay and Mahmoud (2004) find that the endowment of natural resources influences economic growth through macroeconomic volatility, institutional quality, economic policy, or a combination of these aspects. However, they do not give a theoretical explanation of the differences among these possible

This result is similar to what Sala-i-Martin and Subramanian (2003) find. They consider that oil and mineral exploitation is usually done through contracts with governments or by government-owned firms. When a country has these resources there is an incentive to invest in political power in order to capture the rents generated by natural resources. Additionally, when a group is in power they invest the rents from natural resources to keep their position (and not necessarily to promote growth).[2] Thus the existence of certain products diverts resources from economic growth to rent-seeking.

Acemoglu *et al.* (2001) consider countries in the New World with different colonial origin and suggest that environmental conditions influenced colonization strategies. Their argument is that in regions with a tropical environmental, colonizers had higher mortality rates and had the incentive to extract as many resources as possible and leave;[3] whereas in temperate regions, like the northern part of America, the benevolent environment created an incentive to settle. Where colonizers settled, they created better institutions to protect their own property and other rights.

Sokoloff and Engerman (2000) also claim that geography affected institutions through different factor endowments. They suggest that in regions where natural conditions made profitable the production of certain crops like sugar or coffee, highly unequal institutions were established. They argue that large-scale plantations of tropical products with slave labor were highly profitable (e.g., in the Caribbean colonies); in such places the elite also controlled the political power in order to sustain these unequal

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channels of transmission. It could be argued that these channels of transmission are correlated; for instance, good institutions might determine sound economic policy.

[2]Sala-i-Martin and Subramanian (2003) suggest that poor economic performance in Nigeria, in spite of their oil wealth, could be explained by this reason.

[3]Diseases were easily transmitted in tropical environments, which led to higher mortality rates in these areas, according to Acemoglu *et al.* (2001).

institutions. Sokoloff and Engerman (2000) develop a similar argument for colonies rich in minerals and abundant in native labor (e.g. Peru, Mexico); in these regions, colonizers established economic institutions that could exploit the abundant native labor for mining.

In another line of research, Bockstette *et al.* (2002) argue that a common history of state-level structures, complemented with shared values or other cultural traits, helps build better institutions. The authors estimate and use a state antiquity measure to capture the tradition of a state structure for a set of countries. They find that the state antiquity measure is correlated with institutional quality, political stability, income and growth.

Nevertheless, the institutional transmission mechanisms just described do not explain the emergence of Ecuadorian institutions very well. Under the logic of Acemoglu *et al.* (2001), the institutions that emerged in the highlands, with a mild environment, should have been better than those established in Ecuador's tropical coast. Additionally, the Ecuadorian coast has historically produced cash crops; Sokoloff and Engerman's argument implies worse institutions in this region compared with the rest of the country. None of these two arguments articulates a relationship between geographical conditions and institutional quality that could explain Ecuador's institutional differences.

Institutions and Economic Performance

Institutions emerge from the interaction of economic agents; specific institutions reflect the choices available to the relevant actors and their bargaining power (Bowles 2000, chps. 4 and 6). Thus institutions are not the same across countries. Moreover, according to Acemoglu *et al.* (2004) and North (1990) institutional differences among

countries explain the distinct economic paths seen in the world, beyond proximate causes of growth (e.g. capital accumulation or technological innovation) and geographical conditions (see Sachs and Warner 2001). Acemoglu *et al.* (2004) and North (1990) affirm that proximate causes of growth are contingent on the institutional infrastructure of each economy. That is, the existence and enforcement of a particular set of institutions create the incentive for investment, whereas lack of them inhibits investment and growth.

Acemoglu *et al.* (2001) and Easterly and Levine (2003) reject the geographical explanation of economic performance: after controlling for institutions, the relationship between income and geography is not significant. Easterly and Levine (2003) find that institutions affect income even after controlling for policy quality and geography. Sala-i-Martin and Subramanian (2003)[4] find that institutions are a stronger determinant of income than geography. Rodrik, Subramanian, and Trebbi (2004)[5] find that institutions have a stronger effect on income than geography and trade.

La Porta *et al.* (2004) challenge these findings at an empirical level. In particular these authors claim that the instrument for institutions mostly used, mortality rates of bishops and soldiers in the 17th, 18th and 19th centuries, is flawed. La Porta *et al*. (2004) claim that this instrument is correlated with the error term; that is, mortality rates not only influenced settlement strategies, but also human capital formation of the colonies.[6] Furthermore, they show evidence that good policies led to economic growth and human

[4]In some specifications natural resources have a weak relationship with income after controlling for institutions.

[5]They find a weak direct effect of geography on income after controlling for institutions. They also find that, once institutions are controlled, trade is "almost always insignificant" (Pg. 131) and has a negative effect on income.

[6]They also find that human capital is a stronger determinant of income, compared with institutions.

capital formation, and these variables led to better political institutions;[7] that is, the reverse causality of what the institutional literature suggests.

In another line of research La Porta *et al*. (1999) find that different legal traditions lead to different governance structures of firms; in particular they find evidence that British common law performs better in this respect than German, Scandinavian and French civil law. The firms that emerged in countries with British common law tradition have enough concentration of shareholders so that big investors monitor managers, and some dispersion of shareholders which diversifies risk.[8] Thus, different legal traditions could influence income through the establishment of firms with more efficient governance structures. In a similar vein, Berkowitz and Clay (2004) find evidence that different legal origins of American states affect current quality of legal institutions, which in turn have an effect on income.

Acemoglu and Robinson (2005) try to estimate the effect of contracting and property rights institutions on growth, investment, credit to the private sector and development of financial markets. They instrument the former set of institutions with legal origin and the latter with mortality rates. The find that property rights institutions affect all the dependent variables. Also, once property rights institutions are controlled, contracting institutions only affect the development of financial markets. Thus they conclude that legal origin affects contracting institutions, but these do not influence economic outcomes.

[7]One example that these authors point is Chile, which had a period of substantial growth during a dictatorship and then switched to a democratic regime.

[8]Other legal traditions are correlated with more extreme firm governance structures, like high concentration or high dispersion of shareholders.

Bardhan (2005) uses the state antiquity measure estimated by Bockstette *et al.* (2002), as an instrument for electoral participation (the institutional variable). Also, this author uses years of schooling and income as dependent variables. One of his conclusions is that state antiquity is a better instrument of institutions, especially when schooling is the dependent variable. This result suggests the relevance of other institutions (different than property rights) for economic outcomes, in particular the political institutions that affect electoral participation.

At a within-country level, Decuir-Viruez (2006) tests the variations of institutional quality and income across Mexican states for the period 1970-2000. In order to do so Decuir-Viruez (2006) first estimates an index of institutional quality based on various measures of the following criteria: political force and public institutions, action capacity of governments, population composition and social context, external links, and infrastructure composition. The category for action capacity of governments includes the average percentage of income collected from taxes, which will be a proxy of institutional quality used in Chapter 4 of this thesis.

An additional drawback of the empirical literature is that the link of an instrumental variable on current institutions is not adequately tied. For instance, the casual link of mortality rates in past centuries with current risk of expropriation is not clear. Moreover, the elaboration of this link requires a historical account. Hence reliance on econometric analysis might leave out of the debate other aspects of institutional analysis, like the persistence of certain institutions.

The empirical references mentioned above have focused on the relation between institutions and economic performance at a cross-country level, and have given insights

on how these variables might interact. The strategy usually followed is the estimation of institutional quality with an instrumental variable. However, instrumental variables do not necessarily take into consideration the heterogeneity of institutional quality in a given country and the mechanisms through which they operate.

Thesis Overview

Chapter two gives an overview of the state of Ecuador and describes its distinct geographical regions: coast, highlands and Amazonia. Chapter three gives a historical narration of the evolution of agrarian institutions in Ecuador's coast and highlands. Chapter three also describes how certain economic outcomes of agrarian institutions have persisted across time; in particular, the agrarian institutions in the highlands determined a high cost to landowners and agricultural workers for switching to another economic activity; whereas in the coast, agrarian institutions allowed more economic diversification.

Since the extent of agricultural production is a consequence of the agrarian institutions established in each region, the share of agricultural production on the total output of each province proxies the quality of the institutions established there. Chapter four creates a natural component of agriculture based on rainfall; which creates a natural and an institutional component of agriculture. Also, this chapter presents results of preliminary statistical analysis that suggests that an institutional component of agricultural production is correlated with income variations across Ecuadorian provinces and extreme poverty variations across provinces of the coast and the highlands. The last chapter concludes.

CHAPTER TWO

Overview of Ecuador

Geography

Ecuador is located astride the equator, from which it derives its name. The country is on the north-western part of South America, with an area of approximately 98,985 squared miles, about the size of Colorado (104,100 squared miles). On its borders are Colombia (north), Peru (south and east), and the Pacific Ocean (west). Ecuador's capital is Quito, the political center. The Andes cross vertically through the country, creating three different regions in the territory: the coast in the west, the highlands (called *sierra*) in the middle, and the Amazonian region (called *oriente*) in the east of Ecuador. Additionally, the Galapagos Islands are part of the country. Figure 1 depicts the three mainland regions.

The coastal region has five provinces, a tropical and subtropical climate and an area equivalent to 27.5% of the country. The highlands region has ten provinces and 25.6% of the country's area;[9] its altitude ranges from 5,000 to 10,000 feet. The Amazonian region has six provinces and a tropical rainforest climate; it is almost half of the Ecuadorian territory, representing 46.6% of the total, has an altitude that ranges from 800 to 3,000 feet. The country has a rainy and dry season, usually called winter and summer; however in each region the seasons have a different period of duration. The rainy season corresponds to the period from December through May in the coast, from

[9]On Wednesday October 5, 2007, the Ecuadorian Congress approved the creation of the province Santo Domingo de los Tsáchilas, dividing Pichincha (highlands).

November through April in the highlands, and from February through December in the Amazonian region. Figure 2 shows a political map of Ecuador.

Figure 1. Physical Map of Ecuador. Map by Geodyssey (n.d.).

In the words of David W. Schodt "visitors to Ecuador will find a fascinating diversity of geography and peoples. . .yet the same features that attract the visitor pose formidable obstacles to the country's economic and political development" (Schodt 1987, 1-2). The regional diversity is reflected in different natural endowments for each region, which has influenced each region's distinctive economic evolution. Additionally, geography has been an obstacle to communication and integration across regions. "Despite the country's small size, most generalizations about it quickly succumb to the differences imposed by climate and topography" (Schodt 1987, 4).

Figure 2. Political map of Ecuador. Map by Encyclopedia Britannica (2001).

Population

Ecuador has a population of 12,156,608 according to the census conducted by the Instituto Nacional de Estadística y Censos in 2001; barely the population of Pennsylvania (12,429,616).[10] The coast is the region with the highest population with just over half of it according to the last census. Table 1 presents the population of each province and its percentage on the national total for 1950 and 2001, in order to show how the population of each province has evolved. Also, as Graph 3 shows the coastal population has not always been larger than in the highlands.

[10]This is the estimate for 2005 according to the U.S. Census Bureau.

Table 1. Population differences across provinces and regions in 1950 and 2001.

	1950			2001		
	population	percentage	density (population/ km^2)	population	percentage	density (population/ km^2)
			Highlands			
Azuay	250975	7.84	31.39	599546	4.96	74.99
Bolívar	109305	3.41	27.84	169370	1.40	43.14
Cañar	97681	3.05	31.09	206981	1.71	65.88
Carchi	76595	2.39	16.13	152939	1.27	32.20
Chimborazo	218130	6.81	33.71	403362	3.34	62.34
Cotopaxi	165602	5.17	27.67	349540	2.89	58.41
Imbabura	146893	4.59	31.83	344044	2.85	74.56
Loja	216802	6.77	19.72	404835	3.35	36.82
Pichincha	386520	12.07	29.13	2388817	19.77	180.01
Tungurahua	187942	5.87	55.78	441034	3.65	130.89
Subtotal	1856445	57.96	28.77	5055633	45.18	84.64
			Coast			
El Oro	89306	2.79	15.35	525763	4.35	90.38
Esmeraldas	75407	2.35	4.74	385223	3.19	24.23
Guayas	582144	18.18	28.31	3309034	27.38	160.90
Los Ríos	150260	4.69	21.01	650178	5.38	90.92
Manabí	401378	12.53	21.24	1186025	9.82	62.77
Subtotal	1298495	40.54	19.01	6056223	50.12	88.64
			Amazonia*			
Morona	25503	0.56	1.07	115412	0.96	4.85
Napo	24253	0.53	0.46	79139	0.65	6.34
Pastaza	13696	0.30	0.47	61779	0.51	2.11
Orellana**	…	…	…	86493	0.72	3.99
Sucumbíos**	…	…	…	128995	1.07	7.16
Zamora	11464	0.25	1.10	76601	0.63	7.33
Subtotal	74916	1.64	0.65	548419	4.54	5.21

Source: Instituto Nacional de Estadísticas y Censos 2001.

*The first two columns have values from 1962, for 1950 only the population for the entire region is available.

** Sucumbíos and Orellana were part of the province of Napo in 1950.

In the census of 2001 conducted by Instituto Nacional de Estadísticas y Censos, the population self-identified in ethnic groups, the percentages are: 77.4% *mestizos* (descendants of whites and native-Americans), 10.5% white, 6.8% natives, 2.7% *mulatos* (descendants of African-Americans and native-Americans), 2.2% African-American, 0.3% other ethnic groups. Nevertheless, this broad picture hides the differences that exist

among Ecuador's regions. In the coast the presence of native-Americans is considerably lower compared with the highlands or the Amazonian region; in particular in provinces like Chimborazo (highlands) or Orellana (Amazonia) the native-American population corresponds to 38% and 30% of the provinces' total, respectively.

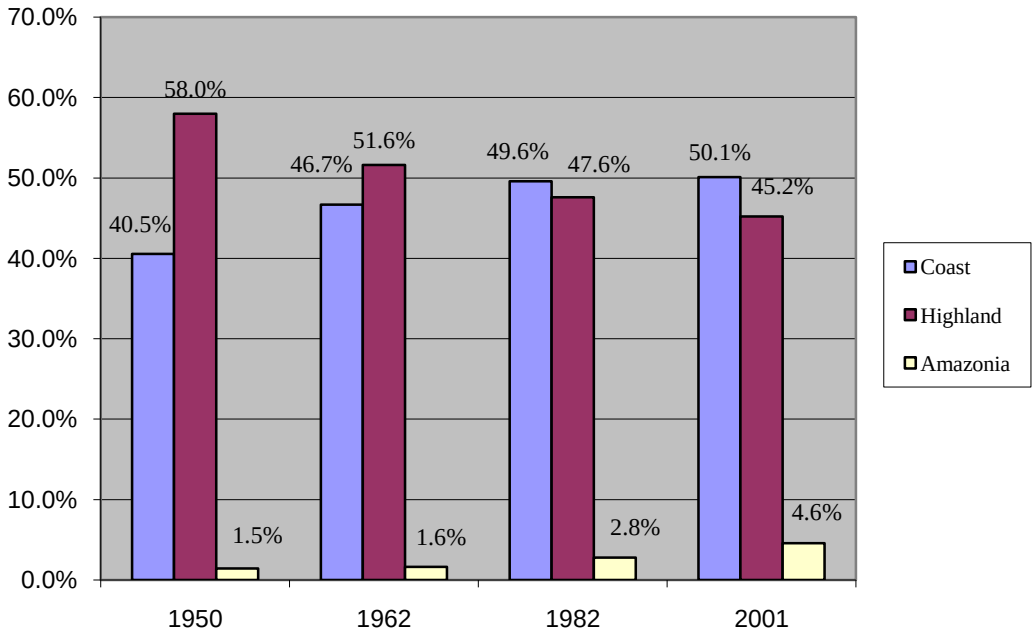

Figure 3. Distribution of the population by region. Source: Instituto Nacional de Estadísticas y Censos 2001.

History

The oldest vestiges of a settled society found in Ecuador correspond to the Valdivia culture (5200 BC) located in the coast. The period of demographic expansion was 1500 BC through 500 BC, when large-scale chiefdoms emerged; examples are Manta, Chono in the coast, and Caranqui in the highlands (Whitten 2003).

The Inka[11] Empire conquered Ecuador approximately in the 1490s, according to estimates of Salomon (1986). However, Inka presence was not distributed uniformly throughout the country; the southern part of the country had a presence of approximately 30 to 40 years according to Salomon (1986), and the northern part had approximately 18 years of presence according to Hurtado (1998).

The Spanish conquest over the territory that now is Ecuador was definite by 1534, the year when Spaniards conquered Quito. Initially, the conquest territory was part of the *Real Audiencia de Lima*, a jurisdiction created by the Spanish crown. In 1563 the crown created the *Real Audiencia de Quito*, formed by the provinces of Quito (northern highlands), Guayaquil (coast) and Cuenca (southern highlands).

In the early days of the colonial period, textile and shipbuilding industries developed in the highlands and the coast respectively. However the former did not survive the Bourbon Reforms introduced by Spain during the 18th century, and the latter could not produce the ships demanded at the time. Agriculture became the most important economic activity; the highlands produced for the internal market and the coast developed cacao production for export.

The Spanish Crown tightly regulated colonial commerce, introduced legal reforms in favor of the native population, and did not allow the access to political power to the elite born in the New World. These policies conflicted with the interests of local exporters and importers (affected by taxes) and landowners who relied on work of the native population. Thus, the interests of the white elite born in the New World, called

[11]The references reviewed that are written in Spanish, Hurtado (1998) and Grijalva (2006), spell "Inca". As for the sources written in English, Salomon (1986) spells "Inca" when he refers to the empire, but spells "Inka" when he refers to the ruler. Townsend (2000) spells "Inka" at all times. This thesis will spell "Inka" always, as this appears to be the convention. The context will try to make clear if reference is made to the empire or to the ruler.

criollos, clashed with the crown's interests (Hurtado 1998). These differences fueled the desire of independence and the colony fully became independent in May 1822. Not until 1830 did Ecuador emerge as a country.

Throughout the late 1700s until the late 1910s, the Ecuadorian coast developed cacao production, the main export of the country. This sector needed the labor that the highlands had. Landowners in the highlands, including the Catholic Church, had restrictive institutions in order to secure the labor of the native population for their benefit. Independence relieved to a certain extent the disagreement over taxes on exports and imports; but the tension over labor persisted. In the period 1830-1920 the struggle to control labor was reflected in the rivalry among liberals (mainly from the coast) and conservatives (mainly from the highlands). Liberals supported less economic restriction, namely more freedom in the labor market and less taxes on exports and imports; while conservatives supported the preservation of the existing structures.

In the first two decades of the twentieth century two factors led to the decline of cacao production: the witch's broom plague and a reduction in demand due to the World War I. During the so called "cacao boom," the Ecuadorian economy and government revenues relied on exports. When cacao production declined, so did the Ecuadorian economy and the financial position of the state, which could be reflected in the political instability of that period. From 1925 and 1948 not a single national president finished his mandate. Stability returned when another "boom," also rooted in the coast, boosted the Ecuadorian economy; from 1949 until 1972, bananas were Ecuador's main export, and they remain its main agricultural export nowadays.

In 1968 oil began to be exploited from the Amazonian region. However, its substantial effect on the economy started in 1972 when international oil prices increased and the economy entered the so called "oil boom." In that year a military coup took over a civilian dictatorship and remained seven years in power.[12] In this period of military government, oil revenues allowed the expansion of external debt, the development of infrastructure, and the promotion of industrialization by import substitution.

Democracy returned to the country in 1979, a bad year for oil prices. The new regime also suffered from the consequence of the debt crisis in Latin America and a violent conflict with Peru (1980). The government reacted by reducing spending, which led to considerable social turmoil. The three presidential periods of 1984-1996 tried to reduce the role of government in the economy without creating further social dissatisfaction. In 1998 Ecuador adopted a new constitution aimed at reducing political instability. However, since 1996 Ecuador has had three elected presidents, none of whom finished their mandate; moreover, since 1996 it has had eight presidents.

Economy

Production

Ecuador's real GDP grew at a yearly average of 3.08% for 1995-2006,[13] according to Banco Central del Ecuador (BCE). In 1999 a financial crisis left the country with part of the financial system bankrupt and a decrease of 6.3% in GDP. The crisis led

[12]Also, in the period 1963-1966 Ecuador had a military dictatorship.

[13]The paper shows information from 1994 because is the earliest available in constant terms. The information for 2006 is provisional.

to a substantial depreciation of the *sucre*, the local currency, which ultimately led to the adoption of the U.S. dollar as the legal currency in 2000.

Table 2 shows the evolution of Ecuador's GDP and its components. The *dollarization* of the economy brought a lower inflation rate that improved the purchasing power of salaries; additionally, migrants' remittances increased at an average yearly rate of 9.58% in 2000-2005.[14] These factors yielded a higher available income that boosted household consumption. A new pipe for heavy oil was finished by the end of 2003; this was a major investment for Ecuador's economy and accounts for most of the growth in capital formation.

Table 2. Average growth rate of GDP components and imports (real terms)

	GDP	Households	Government	Investment	Exports	Imports
1994-1999	0.80%	1%	-0.73%	-5.47%	4.85%	-1.87%
2000-2006	4.71%	5.36%	2.95%	10.81%	5.35%	12.20%

Source: Banco Central del Ecuador.

Ecuador's main export product is oil, other important export goods are: bananas, shrimp, flowers, coffee, cacao and fish, as can be seen in Table 3. In the period 1994-1999 these products combined represented a yearly average of 76.06% of all the exports, and for the period 2000-2006 the average was 73.67%. Oil is extracted from three provinces in the Amazonian region (Napo, Orellana, and Sucumbios). Bananas, coffee,

[14]This number accounts only for the transfers recorded by the Central Bank of Ecuador. The amount of transfers for this period exceeds the exports of bananas, shrimp, coffee, cacao and fish, combined.

shrimp, cacao and fish are produced in the coast.[15] Flowers are the only main export good produced in the highlands.

Table 3. Ecuador's main exports (yearly average)

	Oil	Banana	Coffee	Shrimp	Cacao	Fish	Flowers
percentage of total exports 1994-1999	28.18	21.65	3.93	15.66	2.16	1.85	2.65
percentage of total exports 2000-2006	44.74	15.08	0.94	5.01	1.97	1.41	4.53

Source: Banco Central del Ecuador.

Development

Table 4 presents indicators of education, health, and poverty from Sistema Integrado de Indicadores Sociales del Ecuador, that corresponds to 2001. The Amazonian region fares the worst in education and health measures, except for child mortality; in the other two regions measures are similar. However, results in the highlands are driven by Pichincha, where the capital of Ecuador is located. This province is the most populated and developed province of the region; if Pichincha is removed from the sample, the coast shows better development measures. Additionally, a column with Pichincha data is included to show how this province differs from the rest of the region.

[15]There are provinces of the highlands that produce these goods in the part of their territory that reaches tropical and subtropical environments.

Table 4. Development measures

	National	Amazonia	Coast	Highlands	Highlands*	Pichincha
Illiteracy (% of the population)	9.0	9.3	8.7	9.3	10.8	5.5
Functional illiteracy (% of the population)	21.3	24.8	21.5	20.8	26.2	14.5
Schooling (years)	7.3	6.2	7.2	7.5	5.7	8.9
Life expectancy (years)	74.2	…	…	…	…	…
Mortality (per 1000 habitants)	4.4	…	…	…	…	…
Child mortality (per 1000 living children)	17.3	11.8	15.9	19.4	18.7	21.9
Poverty (% of the population)	39.8	63.0	40.0	37.4	46.5	25.0
Extreme poverty (% of the population)	15.1	39.2	12.1	16.1	22.1	7.7

* Excludes the province

Source: Sistema Integrado de Indicadores Sociales del Ecuador 2007.

CHAPTER THREE

Institutional Evolution in Ecuador

This chapter describes the historical development of agrarian institutions in Ecuador. It is not a thorough description of Ecuador's historical periods. Three major conclusions can be derived from this narrative account of agrarian institutions. First, institutions followed a path-dependent evolution; that is, new institutional arrangements were contingent on the recent history of each society. As described below, the evolving forms of agrarian institutions in Ecuador share remarkably similar features across the centuries, a reflection of path-dependence.

Second, there are two main reasons for divergence among agrarian institutions across the regions in Ecuador. On one hand, the provinces with a larger native population have worse institutions starting no later than the Spanish arrival. On the other hand, natural factors made the coast more suitable for cash crop agriculture. Exporting crops like cacao (and later bananas) provided currency that made possible monetary payments to workers and made available a broader range of institutional arrangements in the coast than in the highlands.

Third, the ways in which agrarian institutions evolved have led to specific economic outcomes in the present day. Current agricultural production levels are obviously the result of geographical conditions favoring the growth of certain crops. But economic institutions have also guided agricultural production by setting a high cost for switching to another activity. The institutional component of agriculture has operated

through two channels. Agrarian institutions provided a source of rents for landowners, who had the incentive to perpetuate them. In addition, landowners who lived off of rents had no incentive to invest, either in agricultural innovation or in other economic sectors. The second channel through which institutional quality affected economic performance was in the labor force. The control that agrarian institutions placed on native labor meant that agricultural production was the default occupation of a substantial part of the population.

The chapter describes the evolution of Ecuador's agrarian institutions in a chronological order, even though institutions overlap among historical periods. That is, the movement from one period to the next does not imply a simultaneous transition of institutions.[1] Nevertheless, a chronological order provides a structured narrative of institutional evolution.

Pre-Columbian Period

Prior to the arrival of the Spaniards in the 1520s and 1530s, the population in the northern Andes had a political unit termed in Spanish *parcialidad*[2] or *ayllu* in Quechua (Inka language), an "extended family" or a "collection of households." One *parcialidad* or a collection of them made up a *llajta*, which could be seen as a "village." According to Frank Salomon (1986, 45), a village consisted of: "persons sharing hereditary rights over certain factors of production (particular lands, the labor of certain people, and

[1]The literature reviewed does not give a clear description of the institutions in the Amazonian region; as a result, this chapter's main focus is on institutions on the coast and the highlands. It is clear though, that the Amazonian region was isolated from the rest of the country until the 1970s when oil started to be produced. The agrarian reforms in the 1960s and 1970s established incentives for the colonization of this region; one consequence has been the appearance of tea plantations with hired labor (Hurtado 1998).

[2]The Spanish word *parcialidad* derives from *parcial* (partial). Thus, *parcialidad* suggests that the object it refers to is not a whole.

specific tools and infrastructure), and recognizing as a political authority a privileged member of their own."

The local chief was usually called *cacique*, who received a tax from the members of a village in labor or goods. This person also commanded hunters and sponsored traders. The *cacique* was a war leader, established military alliances and commercial links with other chiefdoms, settled disputes, enforced moral norms, sponsored feasts, kept records, redistributed goods (e.g. the meat obtained from hunters, maize from his field, textiles made in his household) and presumably had the power to redistribute land. A *cacique* had this role for his lifetime, and also had other "principals" who helped him in his tasks (Salomon 1986). These chiefdoms also used the *mita*, a group whose membership rotated and who performed specific tasks for the local chief. A *mita* was organized for mining, but also for textile confection and occasionally for agriculture (Hurtado 1998).

The Inka economic organization had at least one difference when compared with pre-Inka chiefdoms. This reflected the added complexity of the state structure and was not a wholly new institutional arrangement. Under the Inka, land was divided for three "owners" who were gods and the Inka, the state, and the community. Additionally, Inkas used *mitas* for the benefit of the Inka or the local chiefs. In spite of different degrees in the penetration of the Inkas in the Ecuadorian inter-Andean corridor, a similar structure existed in this region before and after their conquest. The elite planned a considerable part of the economy and received taxes from the community; in exchange the elite redistributed the goods they received and provided military and judicial services. Thus, the Inka conquest did not changed the institutions already in place.

For a number of reason, Inka soldiers did not conquer the people in the coast. First, "the Inka proved unable to permanently conquer lowland peoples whose climate and terrain were so unlike their own" (Townsend 2000, 50). Second, an additional factor might have prevented Inka penetration in this region, according to Salomon (1986, 134) "Inca conquests were limited precisely to those areas where the Cuzco warriors and bureaucrats found structures they could seize on and convert to imperial structures." In the areas where social and political structures were lacking, such as in Ecuador's coastal region, "Inca functionaries performed no miracles" (Salomon 1986, 134).

The four main groups that lived in the coast (i.e. Manta, Huancavilca, Puna, and Chono) organized themselves in tributary chiefdoms, just like the societies in the highlands. The people in the coast had fishing and shipbuilding as additional activities (Townsend 2000).

Colonial Period

Highlands

Once the conquest wars ended, the land that belonged to the Inka (ruler), local chiefs, the state, and the gods was taken for the king of Spain. This land was later distributed to the conquerors; the Spanish crown allowed the native population to keep the land that they already possessed. However, the conquerors disregarded this grant of property rights and instead took the native population's land for their benefit (Hurtado 1998). The dispersed native population was grouped in *encomiendas*, groups of natives entrusted to a colonizer who had financed the conquest wars. Those who received an *encomienda,* called *encomenderos*, were supposed to provide protection and religious

services to the natives, in exchange for receiving a tax in labor, goods or even gold. *Mitas*, the indigenous institution, was also used by Spaniards for small-scale mining (Hurtado 1998).

The *encomienda* provided the *encomenderos* with a right to a portion of the fruits of the natives' labor. It did not provide a property right over land or on the direct use of the natives' labor. Hence, in legal terms *encomienda* was different from slavery. However, the *encomenderos* did use the labor of the natives under their protection for their own benefit in spite of the prohibition of the Spanish crown against it. The first attempt to regulate the *encomienda* failes in 1542, and it was not fully abolished until 1720; and even then, some *encomiendas* for personal service persisted. Furthermore, during the colonial period, the native population was the most important factor of production (Hurtado 1998).[3] Another characteristic of *encomienda* is that it resembled previous structures. "Where Inca rule created large regional entities whose administrative apparatus afforded a ready means of control, the Spanish created equally large *encomiendas* in their image." (Salomon 1986, 134).

Concertaje[4] replaced the system of *encomienda* and maintained the control over native labor by instituting debt peonage. The new institution was legally established in 1601; by *concertaje* natives "freely" reached an agreement with a landowner, in which they provided a specific amount of goods (agricultural, animals, cloth, etc.) in a given period of time. In exchange, the landowner let the native use a small parcel

[3]Hurtado (1998) bases his claim on the work done by Jorge Juan and Antonio de Ulloa, who wrote early descriptions of the Spanish colonies. Jorge Juan and Antonio de Ulloa affirm that the native population was the most important "economic good", to the extent that the importance of a *corregimiento*, a regional political unit, was estimated by the number of natives it had, and not by its extension or cities.

[4]The Spanish word *concertaje* derives from the verb *concertar* (reach an agreement).

(*huasipungo*), and gave the native animals, seeds, and a payment. If the native did not fulfill the agreement, which was usually the case, he incurred in a debt that had to be paid the next period; when the head of the family died his family took over his debt (Hurtado 1998). A crucial element for the enforcement of *concertaje* was that those who did not pay a debt were imprisoned. The transition from *encomienda* to *concertaje* did not eliminate the tributary relationship between the agrarian worker and the landowner. Hence, the tributary system remained, but it was structured by a different mechanism.

Land was the other key factor of production in this agrarian society; moreover, land ownership signaled prestige so the elite tried to secure and extend it. The mechanism to do so was the *mayorazgo*,[5] which meant that land could not be divided for inheritance or sale (Hurtado 1998).

Coast

The *encomienda* had less economic importance in the coast mainly for three main reasons. First, part of the native population of this region had special arrangements with the conquerors. For instance, the natives from Machala and Tosagua[6] did not pay tribute because they were sentries of the coast (Laviana 2002). Second, the increasing labor need was supplied with immigration from other regions (Laviana 2002).[7] Third, *encomienda* did not have a substantial importance as a tributary system in the coast because the population under this system declined at an early stage; for instance, the

[5]In Spanish, this is a legal term that allows a family to bequest all its properties to their older child.

[6]Cities of what now are the coastal provinces of El Oro and Manabí respectively.

[7]The main group was natives from the highlands, but Laviana (2002) also mentions that *mestizos* and white population from the highland migrated. Also, people from Panama, deserters of the Spanish army, and slaves migrated to the coast (Laviana 2002).

encomienda of Yaguachi, in the coastal city of Guayaquil, had 1,000 people in 1556, but in 1574 it only had 110 people (Townsend 2000).[8]

The production of cacao started in the 1600s mainly around the city of Guayaquil; Chiriboga (1980, 9) quotes a city record dated 1627 that said that cacao production was the only activity that the city and its citizens had. Not until the mid 1700s did cacao became the main economic activity of the coast and in the *Audiencia de Quito* (Laviana 2002). The economic organization of the coast allowed more economic opportunities and social mobility to a broader segment of the population; Laviana (2002) cites references from the mid-1700s saying that in Guayaquil *"pardos"* (*mestizos* or *mulatos*, non-whites) were able to acquire wealth. Additionally, the profits generated by this cash crop, and the economies of scale derived from its production, allowed landowners to increase the areas of their holdings.

By the end of colonial period, agriculture became the main economic activity in Ecuador, though with differences in each region. The highland production secured labor through *encomienda* and later with *concertaje*; the coast received it from migration. In both regions *latifundios* (big properties) were consolidated through different mechanisms, but in the coast there was more social mobility.

After Independence

Highlands

Following independence in Ecuador, agricultural production in the highlands was organized through *haciendas*, a "unit of agricultural production that uses dependent labor

[8]Townsend (2000) attributes this reduction to diseases.

and exploits land and labor in a traditional way" (Hurtado 1998, 57).[9] The hacienda initially employed labor through *concertaje*, which was legally abolished in 1918.[10] In the early 1900s the institution used to employ labor in *haciendas* was *huasipungo.*[11] This is an arrangement in which a small piece of land within the *hacienda* is assigned to an agricultural worker by the landowner in exchange for his labor (Acosta 2004). The change from *concertaje* to *huasipungo* implied that the native population did not incur in a debt with the landowner. Nevertheless, the tributary system remained; furthermore, natives still relied on *huasipungo* for their survival. The dependency of the indigenous population to this institution (and the landowner) was considerable, to the extent that when properties were sold, it included the workers therein (Hurtado 1998).

In 1964 an Agrarian Reform act was introduced, and in 1973 another set of legal changes were passed. One consequence of these reforms was the granting of property rights over land to workers of *haciendas*, commonly achieved by granting a property right over the *huasipungo*. Nevertheless, the property rights introduced by the agrarian reform represented only a formal recognition of an informal norm that was already in place (Grijalva 2006),[12] which means that agricultural workers' incentives to use this land did not change substantially. These reforms also abolished the *huasipungo* and other labor relations that did not have a monetary payment (Acosta 2004).

[9]Hurtado (1998) claims that in *haciendas* production took place in a traditional way. However, the lack of innovation or acquisition of new technologies seems a consequence rather than an element of its structure.

[10]Hurtado (1998) claims that *concertaje* persisted until the 1970s.

[11]This is a Quechua term that is used in the literature to denominate the piece of land within a *hacienda* that an agricultural worker uses or to the institution described above.

[12]Grijalva (2006) gives an evolutionary explanation of informal and formal property rights over land held in Ecuador.

Coast

In this region agricultural production was organized in big plantations, which used hired labor, *peonazgo*; the person hired, *peón*, received a small piece of land within the plantation for his use (cacao was not planted in this part though.) The other institution used was called *siembraduría*.[13] In this arrangement the landowner gave a person, *sembrador*, part of his property to grow cacao. This production had to be sold to the landowner, who also gave payments in advance to the *sembrador* so he could sustain himself before harvest (Guerrero 1980). The main characteristic of this arrangement is that it diversified the risk of the landowner, because the *sembrador* became the residual claimant of part of the production.

The emergence of banana production in the coast brought institutional change, in particular the decline of *siembraduría*. Banana production initially took place "on the ruins of the old cacao haciendas" (Sylva 1987, 113) in the late 1940s, expanded to properties of small and medium size during the 1950s, but reverted to big properties after 1965 (Larrea 1987). The big banana plantations are mostly in the province of Guayas, the medium size plantations in the province of El Oro, the small plantations exist throughout the coast (Sylva 1987).[14]

During the 1940s and 1950s, banana production used the same institutions that cacao production had; that is *siembraduría* and *peonazgo*. Since the 1950s the development of this crop had a crucial actor, multinational firms. These organizations

[13]This word derives from *siembra*, sowed land.

[14]An exception is the dry region in part of the province of Manabí.

signed contracts (that specified quantities and prices) with landowners.[15] Thus with part of the risk shared by the multinationals, *siembraduría* was displaced.

From the 1960s and thereafter, the increase of production was done mainly with hired labor. Two types of workers existed: temporary and permanent. The former were mainly hired by the biggest properties, which required labor for specific activities. Temporary workers did not work exclusively in one property, but rotated among multiple estates (Sylva 1987).

Permanent workers were more common in medium and small properties. They performed various agricultural tasks and usually lived within the unit of production, where they also had a small piece of land for their use (Sylva 1987). According to the estimates of Paola Sylva for 1984, permanent workers represented 63% of all the labor in the banana industry (Sylva 1987), and 70% of them lived within the agricultural unit (Sylva 1987). Thus, permanent workers resemble *peonazgo* in that workers live within the agricultural unit, and both are allowed to use a piece of land (of the plantation) for their benefit.

The different agrarian institutions in both regions remarkably share characteristics with previous arrangements. Thus certain economic consequences of agrarian institutions have been perpetuated through time until the present days. In particular, agricultural production has been a result of agrarian institutions because these have retained labor tied to land and provided economic rents to landowners. Thus the current share of agricultural production on the total output of each province is the result of the agrarian institutions established there. Additionally, the differences of agrarian institution, as reflected by the share of agriculture on total output of each province, might

[15]Multinationals also provided technical and financial support to landowners.

explain the variation of income and poverty measures across provinces. Chapter 5 tests empirically these propositions.

CHAPTER FOUR

Empirical Results

This chapter tests statistically if current agricultural output is correlated with institutional quality; in order to do so, a component of agriculture attributable to natural factors only will be estimated, hence creating two series of agricultural output: one explained only by a natural component and another that includes the natural and institutional components. Additionally, this chapter presents regressions of income, poverty and extreme poverty in Ecuadorian provinces with respect to agriculture and the natural component of agriculture; the purpose is to determine which component of agricultural output is correlated with economic performance. The first part of the chapter describes the data; the second part describes the regressions and discusses its results.

Data

The data set includes observations on a number of variables for 21 Ecuadorian provinces for the years 2001-2004.[1] The information of province-level real GDP, and province-level real GDP by sector, was obtained from Banco Central del Ecuador (BCE) from its data base of Cuentas Provinciales, it is available for the period 2001-2004.[2] The

[1]The data set does not include the provinces of Galápagos because it is not in the continental area of Ecuador and thus the analysis of previous chapters does not apply. The Ecuadorian Congress has recently approved the creation of two provinces, Santa Elena in (splitting the coastal province of Guayas) and Santo Domingo de los Tsáchilas (splitting the highlands province of Pichincha), so there is no information available for these new provinces. The presidential approval is pending for both provinces.

[2]Province-level non-oil GDP is available for 1993, 1996, 1999, and 2000; but since this series does not include all the production and is not divided by sector, these years were not included. The BCE labels the values of 2003 and 2004 as semi-definite and preliminary, respectively.

variable *gdp* refers to real GDP of each province. The share of agriculture in total GDP for each province is denoted by *agriculture*; this sector also includes livestock activities. The share of public sector expenditures in total GDP for each province is denoted by *government*; local and national government expenditures are included in this sector.

Government spending on public goods (capital spending) can proxy for institutional quality, because this type of expenditure provides public goods that help solve coordination problems at a local level as suggested by Bardhan and Udry (1999). Decuir-Viruez (2006) uses this measure as a proxy of institutional quality. For the case of Ecuador's local governments, revenues come from transfers from the national government and from local tax collection. Transfers from the national government are a function of the size of the province, population and unsatisfied needs, which tends to change little in time. Thus the extent of public spending at the level of local governments relies on the capacity to raise tax revenues. For this reason, the percentage of local revenues derived from local taxes is a measure of government effectiveness.

The data on local governments' revenues and expenses was obtained from Chauvin and Pérez (2007). These authors compile data of budgets from municipalities and provincial counsels for the period 2000-2005. Data on revenues and expenses is available only for municipalities (classified by province), so this is the set used in the regressions. The series *local tax revenues* refers to the percentages of municipalities' total revenues that are locally collected taxes. Cash outflows for salaries, debt payments and other expenses are grouped in *current expenses*.[3] *Capital expenses* are cash outflows for capital formation (e.g. construction of roads, buildings, etc.). *Capital transfers* are

[3]None of these variables was significant in preliminary regressions (not shown); this is why they were grouped in one account.

cash outflows of municipalities for private entities that are in charge of specific projects (purchases of goods and services are not included in this account.)[4]

Rainfall data is collected and published by Instituto Nacional de Metereología e Hidrología. Their stations are spread throughout the country and among all provinces; only data for 2001 was accessible. The series *rain* is the monthly average rainfall of each province.

The Sistema Integrado de Indicadores Sociales del Ecuador provides information on consumption poverty and consumption extreme poverty in each province. The series *poverty* is the share of the population in each province that cannot access a typical bundle of goods; the series *extreme poverty* is the share of the total population that cannot access a survival basket of goods.

The Instituto Nacional de Estadísticas y Censos provides population data. The series population refers to the number of people living in each province according to the census conducted in 2001. Additionally, in some regressions regional dummies, *amazonia* and *highlands*, were included to control for effects particular to each region. The next table presents descriptive statistics of the variables. Table 5 shows descriptive statistics of the variables used in this chapter.

[4]For instance, the municipality of Guayaquil delegated the construction of a new jetty to the foundation "Malecón 2000"; the transfers made for this purpose were registered in the account *capital transfers*.

Table 5. Descriptive statistics

	Mean	Maximum	Minimum	Standard deviation
agriculture	0.154	0.42	0.007	0.108
agriculture estimate	0.154	0.327	0.065	0.074
capital expenses	0.538	0.752	0.118	0.114
capital transfers	0.032	0.579	0	0.103
current expenses	0.43	0.633	0.246	0.091
log(gdp/population)	0.893	3.409	0.101	0.79
tax revenues	0.105	0.420	0.016	0.08
government	0.047	0.286	0.005	0.066
poverty	0.595	0.866	0.25	0.151
extreme poverty	0.315	0.489	0.065	0.125
rain	147.49	416.77	28.95	115.81

Regressions

Agriculture and Institutional Quality

The regressions presented below use panel data for 21 provinces (subscript *i*) for a period of four years (subscript *t*) from 2001 to 2004. The dependent variable is *local tax revenues*. The coefficients α_i and β_t control for fixed and time effects. Interaction terms are included in the model, to test if agriculture has different effects on each region. The coefficients γ_1, γ_2, and γ_3 are the main interest of the regression; ρ_j is a vector of coefficients for the set of controls, and u_i is the error term. The model estimated is:

$$local\ tax\ revenues = c + \alpha_i + \beta_t + \gamma_1\ agriculture + \gamma_2\ agriculture*amazonia + \gamma_3\ agriculture*highland + \rho_j\ controls + u_i$$

The measure of institutional quality should be negatively correlated with the share of agriculture in each province; Table 6 shows the results. The relationship between *local tax revenues* and *agriculture* has the expected sign but it is not significant when it is the only variable in the regression (column 1). Once the interaction terms are included,

all of them are significant (column 2). However, the interaction term of Amazonia does not enter the equation with the expected sign.

Table 6. Agriculture and institutional quality
(dependent variable: *local tax revenues*, observations: 84)

	1	2	3	4	5	6	7	8	9
constant	0.34	0.34	0.63	0.35	0.40	0.27	0.24	0.25	0.28
	(0.000)	(0.000)	(0.340)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
agriculture	-0.57	-2.03	-2.07	-2.15	-2.00	-2.41	-2.48	-0.54	-0.99
	(0.136)	(0.006)	(0.005)	(0.002)	(0.061)	(0.003)	(0.001)	(0.184)	(0.029)
*agriculture*amazonia*		3.10	3.16	3.22	3.40	4.04	4.11		2.65
		(0.061)	(0.060)	(0.048)	(0.060)	(0.012)	(0.010)		(0.065)
*agriculture*highland*		1.43	1.48	1.64	1.15	1.76	1.89		
		(0.087)	(0.073)	(0.043)	(0.312)	(0.050)	(0.033)		
government			-1.55						
			(0.667)						
current expenses				-0.05					
				(0.217)					
capital expenses					-0.12		0.03	0.02	0.02
					(0.057)		(0.475)	(0.582)	(0.663)
capital transfers						0.20	0.23	0.21	0.22
						(0.006)	(0.007)	(0.011)	(0.009)
adjusted R^2	0.808	0.809	0.807	0.808	0.831	0.854	0.853	0.845	0.851

OLS, heteroskedasticity-consistent standard errors, p-values in parenthesis.

The regression might have an omitted variable bias because *local tax revenues* might be correlated with public spending in each province (i.e. provinces with a larger public sector will require more tax revenues); *government* controls for this effect, but is not significant. The share of salaries, debt, and other expenses (*current expenditures*) in local governments' budgets is included, but is not significant. *Capital expenses* and *capital transfers* are significant when they are included separately (columns 5 and 6), but only the latter is statistically significant when they simultaneously enter the equation

(column 7). Agricultural production is significant and negatively correlated with institutional quality in the coast and the highlands; this correlation is robust after controlling for potential omitted variables.

The relationship of agriculture and institutional quality seems to be different for each region. To test whether the correlation between agriculture and institutional quality is significantly different from zero in the highlands and the Amazonian region, F-statistics were computed testing the null hypotheses of $\gamma_1 + \gamma_2 = 0$ and $\gamma_1 + \gamma_3 = 0$. The p-values are 0.205 and 0.178 respectively, indicating that *agriculture*'s correlation with institutional quality is not statistically different from zero in the highlands and the Amazonian region.

Since the null hypotheses failed to be rejected, one additional equation (column 9) was estimated and *agriculture* is significantly negative. Column 9 includes an interaction term with *amazonia* in order to control for the effect that agriculture has in that region. In this specification *agriculture* and *agriculture*amazonia* are both significant; furthermore, the joint hypothesis that their coefficients are zero is rejected with a p-value of 0.055. The share of agriculture in three provinces (out of six) in the Amazonian region is small due to the significant share that oil production has, rather than a legacy of agrarian institutions. Thus there should not be a negative correlation between these two variables.

It is not likely that causality goes from the dependent to the independent variable. Municipalities' tax revenues basically come from real estate transactions, a tax on the values of estates,[5] and use of vehicles; hence, taxes do not affect agriculture. The variation in the share of agriculture among the provinces is significantly negatively

[5]The tax is levied on the value of the property, which is determined by the municipality according to its location and size. The valuation given by the municipality does not have to reflect the market value of the state.

correlated with the variation in institutional quality (after controlling for agriculture in the Amazonian region), but this result is driven by the provinces in the coast.

Natural Component of Agriculture

Agricultural production is obviously a product of the natural conditions in each province that makes this activity profitable. To control for natural variation across provinces in the suitability for agriculture, the variable *agriculture* is estimated using rainfall data from each province. The fitted values of agriculture from this regression will be defined as a new variable, *agriculture estimate*. The results of the regressions with *agriculture* and *agriculture estimate* in each province can be compared to test whether the natural component of agriculture is correlated with institutional quality. If it is not, then it is more likely that the negative correlation found in Table 6 between agriculture and tax revenues results from institutional factors.

Ideally, a 2SLS regression would be estimated using *rain* as an instrument, but rainfall data are available for only one year. The agriculture estimate could be calculated using the same specification for all the years: in this case the regression will fully exploit the link of rainfall and agriculture but the estimated series could not be used in panel regressions because of perfect multicollinearity with the fixed effects. The agriculture estimate could also be done using one specification per year. This would allow panel regressions, but the small samples will not find a significant correlation between rainfall and agriculture. Therefore the estimates of agricultural production on *rain* were made using 2-year specifications; this strategy allows the use of agricultural estimates in a panel regression and has enough observations to use the relationship between *rain* and *agriculture.* The results are shown in Table 7.

Table 7. The natural component of agriculture
(dependent variable: *agriculture*, observations: 42)

	2001-2002			2003-2004		
	1	2	3	4	5	6
constant	-0.27	-0.17	-0.14	-0.27	-0.17	-0.14
	(0.000)	(0.007)	(0.005)	(0.000)	(0.009)	(0.005)
rain	0.004	0.003	0.003	0.004	0.003	0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
*rain*amazonia*	-0.004	-0.003	-0.003	-0.004	-0.003	-0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
*rain*highlands*	-0.002			-0.002		
	(0.155)			(0.160)		
amazonia	0.33	0.24	0.2	0.33	0.23	0.2
	(0.000)	(0.002)	(0.002)	(0.000)	(0.003)	(0.002)
highland	0.18	0.03		0.19	0.03	
	(0.050)	(0.388)		(0.050)	(0.403)	
adjusted R^2	0.431	0.423	0.431	0.428	0.42	0.427
F-statistic	7.2	8.5	11.3	7.1	8.4	11.2

OLS, heteroskedasticity-consistent standard errors, p-values in parenthesis.

Equations 3 and 6 explain more than 40% of the variations in the share of agriculture on total output among Ecuadorian provinces and have acceptable F-statistics. The series *estimated agriculture* is generated with specifications 3 (for the first and second years) and 6 (for the third and fourth years). The regressions presented in Table 6 are replicated using *agriculture estimate* instead of *agriculture*, and the results are presented in Table 8.

In all of the specifications *agricultural estimate* and the interaction terms are not significantly correlated with institutional quality. Additionally, an F-test was conducted to check if $\gamma_1 + \gamma_3 = 0$ (column 2); the p-value is 0.162, so the correlation between *agriculture estimate* and *local tax revenues* is probably not different from zero. Thus the results presented in Table 6 are likely to be a consequence of the existence and persistence of agrarian institutions, as was argued in the previous chapter.

Table 8. The natural component of agriculture and institutional quality
(dependent variable: *local tax revenues*, observations: 84)

	1	2	3	4	5	6	7	8	9
constant	0.31	13.8	15	12.52	18.99	13.97	13.68	0.32	10.01
	(0.992)	(0.144)	(0.118)	(0.229)	(0.061)	(0.107)	(0.156)	(0.544)	(0.218)
agriculture estimate	-0.04	-36.6	-32.4	-26	-87.3	-51.3	-49.8	-0.8	-69.6
	(0.992)	(0.533)	(0.588)	(0.693)	(0.210)	(0.408)	(0.474)	(0.838)	(0.227)
*agriculture estimate *amazonia*		38.2	33.9	26.9	91.7	52.9	50.4		71.1
		(0.532)	(0.586)	(0.697)	(0.200)	(0.407)	(0.477)		(0.24)
*agriculture estimate *highland*		-59.5	-70.2	-60.8	-45.4	-46.5	-46.8		
		(0.426)	(0.352)	(0.419)	(0.584)	(0.528)	(0.527)		
share of public sector			-1.6						
			(0.648)						
current expenditures				-0.03					
				(0.517)					
capital expenditures					-0.1		0.01	0.03	0.01
					(0.041)		(0.888)	(0.487)	(0.89)
capital transfers						0.2	0.2	0.2	0.2
						(0.011)	(0.022)	(0.009)	(0.021)
adjusted R^2	0.806	0.803	0.801	0.780	0.827	0.844	0.841	0.843	0.843

OLS, heteroskedasticity-consistent standard errors, p-values in parenthesis.

Institutions and Economic Performance

The previous sections have shown that the non-natural component of agricultural production is correlated with institutional quality, and that this result is driven by the coastal provinces. This section examines whether variation in economic outcomes can be explained by variation in institutions among Ecuadorian provinces. Three measures of economic performance will be used: the logarithm of per capita GDP, poverty, and extreme poverty. The strategy will be to contrast the results of the regressions of these

performance measures as dependent variables with *agriculture* and *agriculture estimate* as independent variables.

Agriculture, institutions, and income. Two sets of panel regressions will be estimated, one for each independent variable, the results are presented in Table 8. These sets of regressions will have the following form, respectively:

$$\log(gdp_{it}/population_{i}) = c + \alpha_i + \beta_t + \phi_1\, agriculture_{it} + \phi_2\, agriculture*amazonia + \phi_3\, agriculture*highland + v_i \text{ , and}$$

$$\log(gdp_{it}/population) = c + \alpha_i + \beta_t + \psi_1\, agriculture\ estimate_{it} + \psi_2\, agriculture\ estimate_{it}*amazonia + \psi_3\, agriculture\ estimate_{it}*highland + w_i \text{ ,}$$

where c is the intercept, α_i controls for fixed effects, β_t controls for time effects. The coefficients of main interest are ϕ_1, ϕ_2, ϕ_3 for the first set of regressions and ψ_1, ψ_2, ψ_3 for the second set; v_i and w_i are the error terms. According to the literature reviewed in Chapter 3 the coefficients ϕ_1, ϕ_2, ϕ_3 should be significantly correlated with the dependent variable; that is, the institutional component of *agriculture* is correlated with income.

The coefficient of *agriculture* shows a negative and significant correlation with income, but this activity may present different effects in each region, so interactions terms are included in columns 2 and 4. The role of agriculture in the coast (omitted category) is positive, but negative for the highlands and the Amazonia (although with different magnitudes). All the coefficients are significant. Two null hypothesis are tested to check if $\phi_1 + \phi_2 = 0$ and $\phi_1 + \phi_3 = 0$; that is, if *agriculture* has no effect on the Amazonia and the highlands, the p-values of the F-statistics are 0.013 and 0.052 respectively, so *agriculture*'s partial correlation with income is positive in the coast but negative in the highlands and Amazonia. The coefficients ϕ_1, ϕ_2, ϕ_3 are significant as was expected.

Table 9. The Institutional effect on income
(dependent variable: *log(gdp/population)*, observations: 84)

	1	2	3	4
constant	1.12	1.12	2.32	6.12
	(0.000)	(0.000)	(0.027)	(0.459)
agriculture	-1.21	1.58		
	(0.042)	(0.029)		
*agriculture *amazonia*		-5.89		
		(0.006)		
*agriculture *highland*		-2.71		
		(0.001)		
agriculture estimate			-9.09	47.3
			(0.217)	(0.270)
*agriculture estimate *amazonia*				-56.97
				(0.192)
*agriculture estimate *highland*				-83.41
				(0.203)
adjusted R^2	0.999	0.997	0.999	0.999

OLS with heteroskedasticity-consistent standard errors, p-values in parenthesis.

On the other hand, the effects of *agriculture estimate* on income are not significant, though the pattern of positive and negative signs is the same as in columns 1 and 2. Thus, in columns 3 and 4 the correlations of agriculture with income are not attributable to natural component of agricultural production. Rather, it is the component of agriculture not explained by nature that is correlated with the institutional setting of each province.

Agriculture, institutions and poverty. The following sets of panel regressions use *poverty* in each province as the dependent variable, the models are:

$$poverty_{it} = c + \alpha_i + \beta_t + \mu_1\, agriculture_{it} + \mu_2\, agriculture*amazonia + \mu_3\, agriculture*highland + \theta\, log(income) + v_i\,,$$ and

$$poverty_{it} = c + \alpha_i + \beta_t + \nu_1\, agriculture\ estimate_{it} + \nu_2\, agriculture\ estimate_{it}*amazonia + \nu_3\, agriculture\ estimate_{it}*highland + \theta\, log(income) + w_i;$$

as in the previous case, these models control for fixed and time effects. The coefficients of main interest are μ_1, μ_2, μ_3 in the first set and ν_1, ν_2, ν_3 in the second set. Income per capita is included in order to control for the effect that agriculture might have on *poverty* through income. The coefficients μ_1, μ_2, μ_3 are expected to be significant. The results are shown in Table 10.

The results of the interaction terms with *agriculture* suggest a tenuous effect on poverty for the Amazonian region and the highlands. The null hypotheses that $\mu_1 + \mu_2 = 0$ and $\mu_1 + \mu_3 = 0$ are not rejected. But the joint-null hypotheses that $\mu_1 = \mu_2 = \mu_3 = 0$ and $\mu_2 = \mu_3 = 0$ are rejected (the p-values are 0.014 and 0.016 respectively.) These tests suggest that the specification in equation 3 is valid; however, the hypotheses that the effects of *agriculture* on *poverty* are not statistically different from zero cannot be discarded in the highlands and the Amazonian region.

The results with *agriculture estimate* show a different pattern of signs for the coast and the Amazonian regions; that is, the natural component of agriculture is negatively correlated with *poverty*, but when both components are considered *agriculture* has a positive correlation. The results for the interaction terms again suggest different effects in each region. However, the null hypotheses that $\nu_1 + \nu_2 = 0$ and $\nu_1 + \nu_3 = 0$ are not rejected. But the joint-null hypotheses that $\nu_1 = \nu_2 = \nu_3 = 0$ and $\nu_2 = \nu_3 = 0$ are rejected (the p-values are 0.0002 and 0.002 respectively.) These results suggest that the correlation of *agriculture estimate* and *poverty* is driven by the coastal provinces.

Table 10. The Institutional effect of agriculture on poverty
(dependent variable: *poverty*, observations 42)

	1	2	3	4	5	6
constant	0.3	-0.39	-0.23	2.08	2.67	-10.94
	(0.033)	(0.431)	(0.622)	(0.154)	(0.060)	(0.682)
agriculture	1.72	3.13	27.88			
	(0.364)	(0.129)	(0.003)			
*agriculture *amazonia*			-26.83			
			(0.005)			
*agriculture *highland*			-25.07			
			(0.008)			
log (gdp/population)		0.7	0.54		-0.23	-0.20
		(0.145)	(0.229)		(0.236)	(0.323)
(log (gdp/population))^2		-0.12	-0.10			
		(0.058)	(0.073)			
agriculture estimate				-11.77	-14.29	-389.6
				(0.249)	(0.151)	(0.002)
*agriculture estimate *amazonia*						380.5
						(0.005)
*agriculture estimate *highland*						471.9
						(0.008)
adjusted R^2	0.855	0.859	0.888	0.851	0.850	0.864

OLS with heteroskedasticity-consistent standard errors, p-values in parenthesis.

Institutions reverse the relationship of agriculture and poverty in the coast. Because the coast produces cash crops for export, more agriculture should increase income and thus reduce poverty, this expectation is met by the coefficient of *estimated agriculture*. However, these products have economies of scale, which implies that the size of agricultural units tends to be big compared with other crops. As a result, land tends to concentrate in a few landowners. Hence, cash crops influence the emergence of institutions that induce inequality and thus poverty, as Sokoloff and Engerman (2000)

suggest. *Agriculture estimate* and *agriculture* do not appear to be correlated with *poverty* in the highlands and Amazonian region.

Agriculture, Institutions and Extreme Poverty. The last set of panel regressions has *extreme poverty* as dependent variable. The explanatory variables for the first and second set are *agriculture* and *agriculture estimate* respectively; the models estimated are:

$$extreme\ poverty_{it} = c + \alpha_i + \beta_t + \sigma_1\ agriculture_{it} + \sigma_2\ agriculture*amazonia + \sigma_3\ agriculture*highland + \sigma\ log(income) + v_i\ ,\ \text{and}$$

$$extreme\ poverty_{it} = c + \alpha_i + \beta_t + \tau_1\ agriculture\ estimate_{it} + \tau_2\ agriculture\ estimate_{it}*amazonia + \tau_3\ agriculture\ estimate_{it}*highland + \sigma\ log(income) + w_i,$$

where α_i and β_t control for fixed and time effects. The coefficients of main interest are σ_1, σ_2, σ_3 in the first set and τ_1, τ_2, τ_3 in the second set; v_i and w_i are the error terms. Income per capita is included in order to control for the effect that agriculture might have on *extreme poverty* through income. The coefficients σ_1, σ_2, σ_3 are expected to be significant. The results are presented in Table 11.

The coefficients of the interaction terms suggest a small effect of *agriculture* on the highlands and the Amazonian region. The hypothesis that $\sigma_1 + \sigma_2 = 0$ is not rejected; but the hypothesis that $\sigma_1 + \sigma_3 = 0$ is rejected (the p-value is 0.010.) The specification in equation 3 is valid; although the hypothesis that the correlation of *agriculture* with *extreme poverty* is not statistically different from zero cannot be discarded in the Amazonian region. The coefficients σ_1 and σ_3 were significant as expected.

Table 11. The Institutional effect of agriculture on extreme poverty
(dependent variable: *extreme poverty*, observations 42)

	1	2	3	4	5	6
constant	0.02	-0.15	-0.08	1.13	3.44	0.2
	(0.843)	(0.494)	(0.705)	(0.272)	(0.268)	(0.992)
agriculture	2.21	2.52	26.44			
	(0.129)	(0.093)	(0.009)			
*agriculture *amazonia*			-25.29			
			(0.039)			
*agriculture *highland*			-24.13			
			(0.015)			
log (gdp/population)		0.15	0.08		-0.09	-0.06
		(0.427)	(0.637)		(0.670)	(0.762)
agriculture estimate				-21.66	-22.58	-368.8
				(0.299)	(0.299)	(0.034)
*agriculture estimate *amazonia*						348.5
						(0.052)
*agriculture estimate *highland*						366
						(0.068)
adjusted R^2	0.701	0.688	0.707	0.708	0.693	0.691

OLS with heteroskedasticity-consistent standard errors, p-values in parenthesis.

The regressions of *extreme poverty* on *estimated agriculture* show a different pattern of signs on the coefficients for the coast and the Amazonian region; the natural component of agriculture is correlated with less extreme poverty, but when the institutional component is included the correlation is positive. The results also suggest different effects in each region. However, the hypotheses that $\tau_1 + \tau_2 = 0$ and $\tau_1 + \tau_3 = 0$ cannot be rejected. Thus *estimated agriculture* affects only the coastal provinces.

The results obtained for the coast are similar to those obtained Table 10; so an analogous reasoning explains the findings with *extreme poverty* as dependent variable. In the highlands the results differ. *Agriculture* is significantly correlated with *extreme poverty*, but is not correlated with poverty. Hence, the agrarian institutions of this region seem to affect the segment of the population that is below *extreme poverty*.

Synthesis of the Empirical Results. The two proxies of institutional quality used in this chapter, agricultural output and tax revenues, are correlated only for the coastal provinces, after controlling for potential omitted variables. The natural sources of variation in agricultural production are not correlated with institutional quality. This result suggests that tax revenues do not fully capture the institutional variations across all the Ecuadorian provinces.

In the coast the institutional component of agriculture is correlated with higher per capita income, more poverty, and extreme poverty. Cash crops are highly profitable. This explains the correlation of agriculture with income in the coast; but since cash crops create agrarian institutions that induce inequality, as suggested by Sokoloff and Engerman (2000), the share of agricultural production in the coast is correlated with poverty and extreme poverty.

In the highlands the effect of institutions on agriculture is correlated with less per capita income and more extreme poverty. Perhaps agrarian institutions do not enhance agricultural productivity and thus reduce output. Also, institutions affect only the segment of the population under extreme poverty, but not the population under poverty and above extreme poverty. In the Amazonian region agriculture is negatively correlated only with less per capita income. However this finding might be capturing the correlation of considerable oil production (and low agricultural production) with income.

CHAPTER FIVE

Conclusions

Dependence on agricultural production is a consequence of the persistence of agrarian institutions. Exploitative agrarian institutions created economic rents for landowners and prevented agrarian workers from changing to another economic activity. Additionally, the share of agricultural production is positively correlated with income in the Ecuadorian coast, but negatively correlated in the highlands. Also, the share of agricultural production is correlated with more extreme poverty across provinces of the coast and the highlands. Hence, income per capita and extreme poverty differences might be rooted in distinct institutional arrangements.

The agrarian institutions that emerged in each region were influenced by geographical factors. In particular, the relative abundance of native population in the highlands created an incentive to preserve a tributary system that could exploit the product of agricultural labor which implies the extension of agricultural production. In the coast, monetary payments induced by cash crops production combined with the relative scarcity of labor induced the emergence of better economic institutions; in this region, a labor market developed as well as a partnership system in which the agricultural worker was a residual claimant of production. Hence the agrarian institutions in the coast promoted wealth accumulation, social mobility and economic diversification. This result helps understand why the Ecuadorian coast has a smaller share of agriculture on their total output in spite of having a substantial production of cash crops.

The results of this thesis extend previous research that link institutional quality with geographical conditions. The literature reviewed links the emergence of unequal or extractive institutions with the production of cash crops, oil or minerals. However, the Ecuadorian case suggests that availability of conquered population was the key factor that determined the emergence of extractive institutions. Additionally, this finding suggests that cross-country studies might ignore crucial elements that cause institutional emergence and change.

The statistical strategy followed in this thesis found that the natural component of agricultural production is not correlated with measures of institutional quality or economic performance. However, there is a need for an adequate variable that could instrument the institutional component of agricultural production. Such variable could allow 2SLS regressions, a suitable tool for the empirical analysis of institutions and economic performance.

This thesis has not explored the link between economic and political institutions. If these institutions co-evolve then further understanding of this link might shed light on other determinants of institutional evolution. Furthermore, this thesis explored the role that agrarian institutions had in the economy but other sets of institutions might be relevant for the study of the Ecuadorian economy and developing economies in general. For instance, the extent of the rule of law is likely to vary across provinces, which in turn could influence economic outcomes.

The economic differences across regions in Ecuador could be explained by the different institutions that their geographical conditions determined. A similar argument might help understand the economic differences that exist across regions in countries like

Peru or Bolivia. For instance, the differences in economic performance among Bolivian regions: west of the Bolivian Andes (e.g. Potosí), the Bolivian highlands (*altiplano*), and the region east of the Andes (e.g. Santa Cruz), might be explained by the institutions established there. Thus, this case study of Ecuador may have larger implications for development in other South American countries.

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